Host response to biomaterials evaluated through different implantation models

T. C. Santos[1,2], A. P. Marques[1,2], A. G. Castro[2,4], M. van Griensven[3], R. L. Reis[1,2]

[1]3B's Research Group - Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, AvePark, 4806-909 Taipas, Guimarães, Portugal
[2]ICVS/3B's - PT Government Associate Laboratory, Braga/Guimarães, Portugal
[3]Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, Research Centre AUVA, Austrian Cluster for Tissue Regeneration, Donaueschingenstrasse 13, A-1200 Vienna, Austria.
[4]Institute of Health and Life Sciences, School of Health Sciences, University of Minho, Campus de Gualtar, 4710-057, Braga, Portugal

Objectives: The host response to a foreign body inherent to the biomaterials' implantation depends on both host and implanted material, particularly considering the host tissue diversity. The aim of this study was to compare the inflammatory response induced by implantation of starch-based scaffolds subcutaneous (SC) and intramuscular (IM) in rats.
Methods: Two methodologies, wet spinning (WS) and fibre bonding (FB)), were used to prepare the scaffolds. The inflammatory response was assessed in male Sprague-Dawley rats (n=2), weighting 380-400g, 1 and 2 weeks post-implantation. In both models 4 scaffolds were implanted: SC through incisions in the dorsum and IM into the left and right scalenus dorsalis and gluteus muscles, respectively. The animals were kept in single-housed with food and water ad libitum and received analgesia in the first week. After each time period, each animal was anaesthetized with an intramuscular injection of ketamine/xylazine and sacrificed with an intracardial overdose. The scaffolds, surrounding tissue and nearby lymph nodes were explanted and used for histological analysis.
Results and Discussion: The WS and FB SPCL scaffolds did not elicit extensive leukocyte recruitment in both subcutaneous and intramuscular implantations in rats. The subcutaneous implantation induced a slightly higher inflammatory response as compared to the intramuscular implantation. However, in both situations the nearby lymph nodes showed to be activated in the earlier stage, but less activated later in the implantation. Additionally, both WS- and FB-SPCL scaffolds showed to be well integrated in the host, independently of the site of implantation.
Conclusions: The overall data suggests a good integration of the materials in the host, independently of the tissue location. The results showed that the SC implantation induced a slightly higher inflammatory response than the IM implantation with early activation of the lymph nodes. Nonetheless, a normal progress of the reaction was observed for all the conditions.

Keywords: "subcutaneous implantation"; "intramuscular implantation"; "host reaction"; "biomaterials".